Feb. 25, 1964 E. KRAUTH 3,122,121

SYSTEM FOR PROPELLING AND STEERING VESSELS

Filed Dec. 16, 1960 2 Sheets-Sheet 1

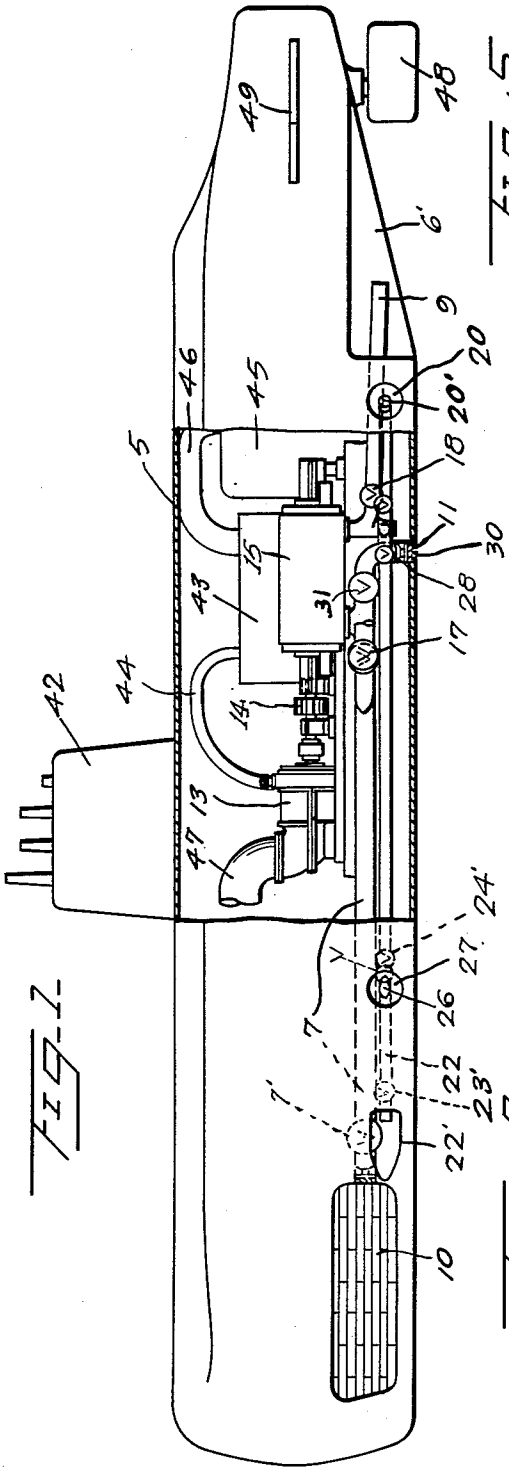


FIG. 1

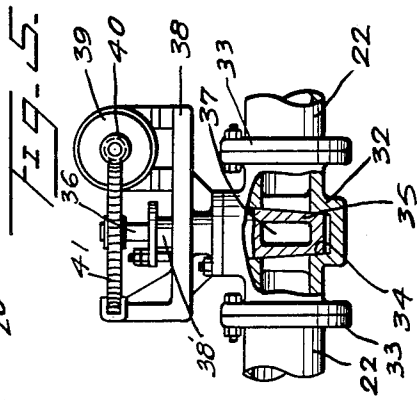


FIG. 5

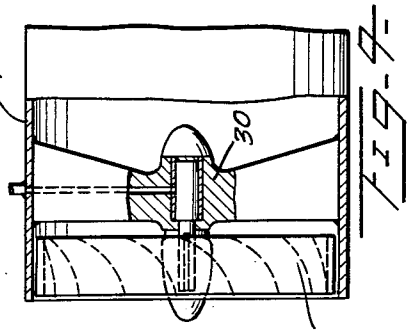


FIG. 4

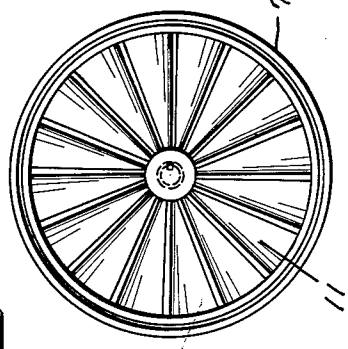


FIG. 2

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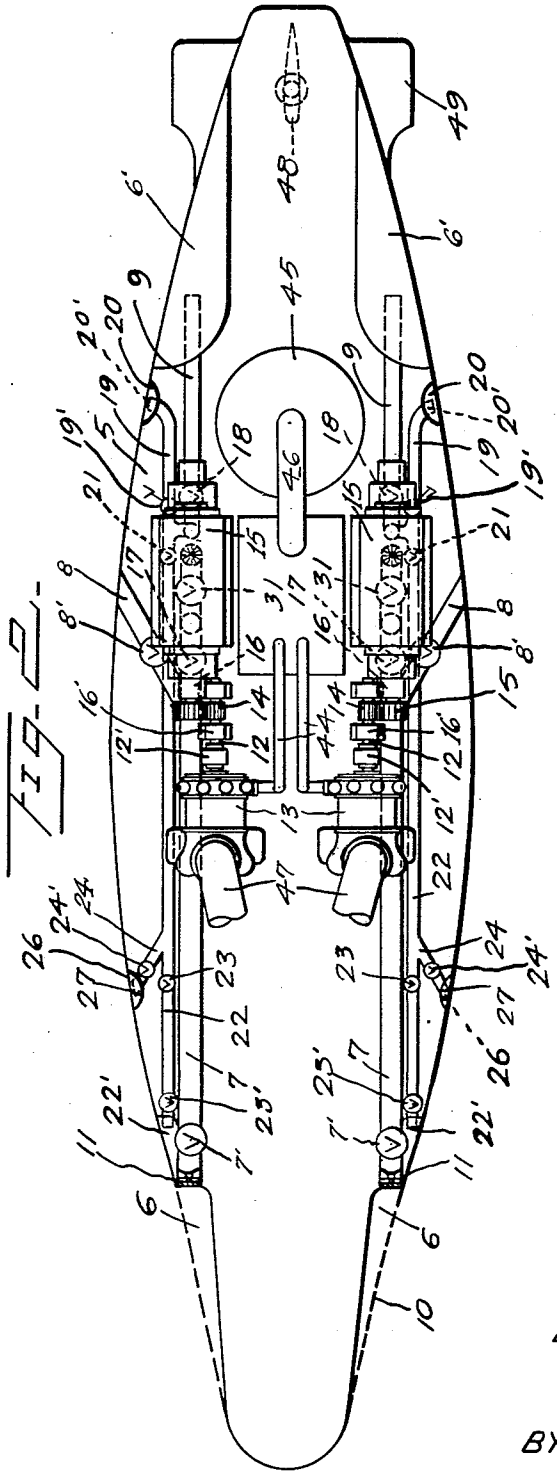
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SYSTEM FOR PROPELLING AND STEERING VESSELS

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FIG. 2



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3,122,121

SYSTEM FOR PROPELLING AND STEERING VESSELS

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3 Claims. (Cl. 115—12)

This invention relates to hydrojet propulsion and steering of vessels, primarily submarines.

A primary object of the invention is to provide a pair of pumps arranged in parallel relation with respect to each other, said pumps being arranged at opposite sides of the hull of the boat or vessel and with water intakes at the port and starboard sides of the bow of the vessel and with independent water discharge lines at opposite sides of the stern of the vessel. This arrangement effects rapid maneuverability of the vessel in case of emergency and in the event of failure of the normal steering mechanism.

Another object of the invention is to provide reversing jets at the port and starboard sides of the bow of the vessel for retarding and reversing forward motion of the vessel.

A further object of the invention is the provision of auxiliary emergency discharge lines at the starboard and port sides of the midsection of the vessel, the latter discharge lines being valve controlled for effecting flushing of the main inlet water pipes due to accumulation of foreign matter therein and flushing to be effected by either forward or reverse motion of the vessel.

A further important object of the invention is to provide emergency valved water inlet pipes from the bottom of the hull to pumps for operation of the vessel during flushing of the main water inlet pipes.

Another object of the invention is to provide an arrangement of valves controlling the flow of water through the pipe lines of the hydraulic system, which valves may be controlled electrically or by air for operation from the conning tower or engine room.

Still other objects, advantages and improvements will become apparent from the following specification, taken in connection with the accompanying drawings.

Referring to the drawings:

FIGURE 1 is a side elevational view of the hull of a submarine vessel portions thereof having been broken away, illustrating the location and relation of the various component parts of my improved propelling mechanism, with respect to each other.

FIGURE 2 is a top plan view of the vessel, the deck of the vessel having been removed.

FIGURE 3 is an end elevational view of the inlet end of one of the water pipes or tubes, illustrating a disintegrator mounted therein.

FIGURE 4 is a fragmental sectional view of the inlet end of a water pipe illustrating the disintegrator in side elevation.

FIGURE 5 is a side elevational view partly broken away of one of the power operated control valves.

Referring to the drawings in detail, the invention embodies a system of hydrojet propulsion embodying a pair of power plants arranged in parallel relation with respect to each other at opposite sides of the vessel and since the power plants are identical only one power plant will be described in detail.

The hull of a vessel of the submarine type is indicated generally by the reference character 5, and as better shown by FIGURE 2 of the drawings, the hull is formed with channels 6 disposed longitudinally thereof at the port and starboard sides of the vessel, which channels gradually increase in width towards the rear ends thereof, or where the main inlet water pipes 7 communicate with the channels. These pipes 7 have valves 7' adjacent to the forward ends thereof, which are synchronized with outlet valves 18, from turbine driven pumps to be now described thereby avoiding surges of water at all speeds.

The main inlet pipes 7 extend rearwardly and feed water to the high pressure centrifugal water pumps 15, mounted substantially midship, there being provided discharge jet pipes 9 communicating with said pumps 15 that have the outlet valves 18 therein and their discharge ends disposed within the forward ends of channels 6' located in the side walls of the hull of the vessel at the stern thereof.

Screens 10 are located over the open sides of the channels 6, and guard the channels against foreign matter entering the channels and inlet pipes 7. Disposed within the forward ends of said pipes 7, are self-powered impellers 11 designed to disintegrate material such as debris or fish that may be drawn into pipes 7 by the pumps 15.

Foreign material collected in the main inlet water pipes 7 is disposed of through flushing pipes 8, which are connected between the pipes 7 and the inlets of the water pumps 15 and are controlled by valves 8'. When flushing, the main inlet water pipes 7 are closed by valves 17 at pumps 15 and the valves 8' of the flushing pipes 8 are opened. Flushing of the main inlet water pipes 7 can be affected by forward movement of the vessel. During flushing of the main water inlet pipes 7, water is supplied to pumps 15 through auxiliary water inlet pipes 28, which extend through the bottom of the hull 5, connect with the inlets of the pumps and have valves 31 therein for operating the vessel in a manner to be hereinafter more fully described.

The pumps 15 are operated through couplings 12', drive shafts 12 and reduction gearings 14 which are drivably connected to the forward ends of shafts 16 of the pumps.

Inlet valves 17 are connected in the main water inlet pipes 7 and control the flow of water to the pumps 15, while the outlet valves 18 are connected in the discharge jet pipes 9 and control the discharge of water from the pumps. Thus it will be obvious that, due to the arrangement of the pumps and inlet and discharge pipes, the force of the water discharged through the discharge jet pipes 9 will act to propel the vessel forwardly.

In addition to main inlet water pipes 7 and discharge jet pipes 9, each pump 15 has connected thereto a stern steering jet 19 which extends rearwardly therefrom, controlled by a valve 19' the discharge ends 20' of said steering jets 19 being directed laterally, as clearly shown by FIGURE 2 of the drawings, and the laterally extended ends of these jets 19 being disposed within cavities 20 formed in the outer surfaces of the ship's hull at the stern of the vessel. Valves 21 and 23 are connected in reversing jet pipes 22 and control the flow of water from the pumps 15, to the reversing jet pipes 22 and the bow steering jets 24. These bow steering jets 24 are positioned on the opposite sides of the hull 5, forwardly of the transverse center line of the latter, and one at a positive obtuse angle on the starboard slide and the other at an equal negative obtuse angle on the port side with respect to the longitudinal center line of the hull. The reversing jet pipes 22 also have therein normally closed valves 23' for avoiding losses caused by water surges.

The reversing jet pipes 22 extend forwardly from the pumps 15 for reversing the direction of movement of the vessel and the flow of water through these pipes is controlled by valves 21, 23, and 23' which are power operated and controlled by the attendant in the conning tower 42 of the vessel.

The bow or steering jets 24 are controlled by valves

24' that are in communication with the reversing pipes 22 associated therewith, the discharge ends 26 of the bow jets 24 and 25 terminating within recesses 27 formed in the outer surface of the hull of the vessel, so that water pumped into the steering jets will be discharged laterally, effecting rapid steering of the vessel.

The auxiliary water inlet pipes 28 through which water enters the water pumps 15, during flushing, extend through openings in the bottom of the hull 5 of the vessel, and the intake ends of said pipes 28 are protected against foreign matter entering the pumps by the rotary disintegrators 11 mounted in bearings 30, the disintegrators 11 mounted in the inlet ends of the pipes 28 being identical with the disintegrators mounted in the ends of main inlet water pipes 7.

The valves 31 control the flow of water into pumps 15.

As shown in FIGURE 5 of the drawings, the several valves are identical in construction and each valve is enclosed by a valve housing 32, which has flanges on its opposite ends to be bolted to the flanged ends 33 of the reversing pipes 22. The valve housing 32 has a valve seat 34 on which the tapered valve member 35 seats, said valve member 35 having a port 37 which is adapted to align with the ends of the pipes 22 that are connected to the valve housing. Each valve member 35 is provided with a vertical valve stem 36 that operates in a vertical bearing 38' that forms a part of bracket 38 which provides a support for a motor 39. The motor 39 has a worm shaft 40 that meshes with a worm gear 41 keyed or otherwise secured to the vertical valve stem 36, whereby the motor operates to rotate valve member 35 as desired, the motor being controlled from the conning tower 42.

The power plant embodies a nuclear fired steam boiler 43, which is in communication with the turbines 13 through steam turbine inlet pipes 44, the boiler 43 being connected with the nuclear reactor 45 through a pipe 46. The steam turbine discharge pipes are indicated by the reference character 47, and connect with the condensers of conventional construction (not shown).

A conventional type of rudder is indicated by the reference character 48, and the reference character 49 indicates conventional stabilizer fins.

In the use and operation of the invention steam, being the prime mover in this case, from the power plant or boiler 43 enters inlet pipes 44 driving turbines 13, which drive the high pressure centrifugal water pumps 15 that supply water at desired pressure to the jets for propulsion, steering, maneuvering the vessel forward or reversing the vessel. The pumps 15 are driven by the turbines 13 through flexible couplings 12' and the reduction gearings 14, which are mounted on drive shafts 16 supported by bearings 16'.

Forward motion is imparted through the main discharge jet pipes 9, reversing motion being imparted through the main inlet pipes 7. To quickly check forward motion, or to bring the vessel to a stop, reversing jet pipes 22 and steering jets 24 at the bow are used simultaneously to provide a great retarding action, while speeding up the pumps 15.

Viewing the vessel from the stern and looking toward the bow end, steering is effected as follows; starboard turning is effected by using starboard steering jet 19 at the stern and port steering jet 24 at the bow, and may be further augmented by simultaneously using the main propulsion jet 9 on the port side of the vessel. Port turning is effected by using the port steering jet 19 at the stern of the vessel, and the starboard steering jet 24 at the bow of the vessel, which may be supplemented by using the main propulsion jet 9 on the starboard side of the vessel. Lateral motion of the vessel from right to left can be effected by using the starboard steering jets 19 and 24 simultaneously. Angular lateral motion to port or starboard of longitudinal center line or to completely turn the vessel on the spot, can be effected by varying the discharge of water from the proper steering jets 19 on both sides of the vessel simultaneously. Lateral motion of the vessel from left to right will, of course, be effected by the use of port steering jets 24 and 19, simultaneously. Angular lateral motion to port or starboard of the longitudinal center line, or to completely turn the vessel on the spot, can be effected by varying the discharge of water from the proper steering jets 19 on both sides of the vessel simultaneously. Steering may also be augmented by the rudder 48, which would be indispensible when the power is shut off and the vessel is coasting.

Having thus described the invention, what is claimed is:

1. A combined propulsion and steering system for a vessel comprised by pumps mounted within the hull of the vessel on the opposite sides of the longitudinal center line of the latter, main water inlet pipes positioned longitudinally of the hull of the vessel on the opposite sides of the longitudinal center line of the latter and having intakes through the hull of the vessel at the bow of the latter and connected respectively at their opposite ends to the intakes of the pumps, valves in said main inlet pipes between the intakes of the latter and the respective intakes of the pumps, discharge and propulsion pipes positioned longitudinally of the hull on the opposite sides of the longitudinal center line of the latter connected respectively at one end to the outlets of the pumps and extending through the hull of the vessel at the stern thereof and forming propulsion jets, reversing pipes positioned longitudinally of the hull on the opposite sides of the longitudinal center line of the latter, terminating at one end in jets extending through the hull of the vessel at the bow of the latter and connected at their other ends to the outlets of the pumps, bow steering jets connected respectively to said reversing pipes and extending through the hull of the vessel forwardly of the transverse center line of the latter auxiliary water inlet pipes having intakes at one end through the bottom of the hull of the vessel and connected respectively to the intakes of the pumps, valves in said latter intake pipes, flushing pipes connected respectively to the inlets of said pumps and having outlets through the hull of the vessel and valves in said flushing pipes.

2. A combined propulsion and steering system for a vessel as recited in claim 1 in which self-powered impellers are positioned in the hull of the vessel at the entrances to the main water inlet pipes and ahead of the valves in the latter for disintegrating fish and debris in the water passing through the said main water inlet pipes.

3. A combined propulsion and steering system as recited in claim 1 in which self-powered impellers are positioned in the hull of the vessel at the entrances to the auxiliary water inlet pipes and ahead of the valves in the latter for disintegrating fish and debris in the water passing through the said auxiliary water inlet pipes.

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